Mechelectiv

VOL. 17 DECEMBER 1957 NO. 3

IN THIS ISSUE:

SCHOOL OF ENGINEERING
THE GEORGE WASHINGTON UNIVERSITY

DECEMBER 1957

Molten iron runs white hot from a huge ladle into an open hearth furnace for conversion into steel. The quality of this steel is the responsibility of this engineer. He also assists in coordinating open hearth operations and incoming raw materials and plans improvements in methods. This is a typical example of one of the many opportunities for engineering graduates at United States Steel.

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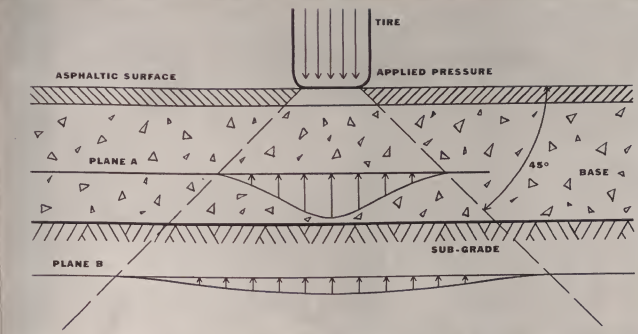
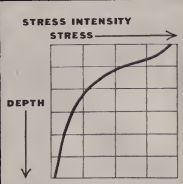


Assume a loaded wheel on a typical Asphalt pavement consisting of Asphalt surface, base course and natural sub-grade. The entire load is transmitted to the pavement by the tire. The load, applied at the surface, is distributed downward and outward through the Asphalt pavement and base into the native soil or sub-grade. The load spreads out at an angle of approximately 45° in the manner indicated above.



Look at the curved line. It shows the approximate manner in which intensity of stresses in flexible type pavements decreases in depth. The total load affects the shape of the curve: the greater the unit load, the greater the stress at the given depth . . . except that it cannot exceed 100% of the contact pressure at the surface.

Design of flexible ASPHALT pavement

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Study the diagrams on this page. They show how the load is distributed on modern Asphalt construction and how the maximum stress varies with depth of pavement.

Be sure to cut out and file this data sheet and those previously inserted in this publication. Make them your professional reference material.

Ribbons of velvet smoothness . . .
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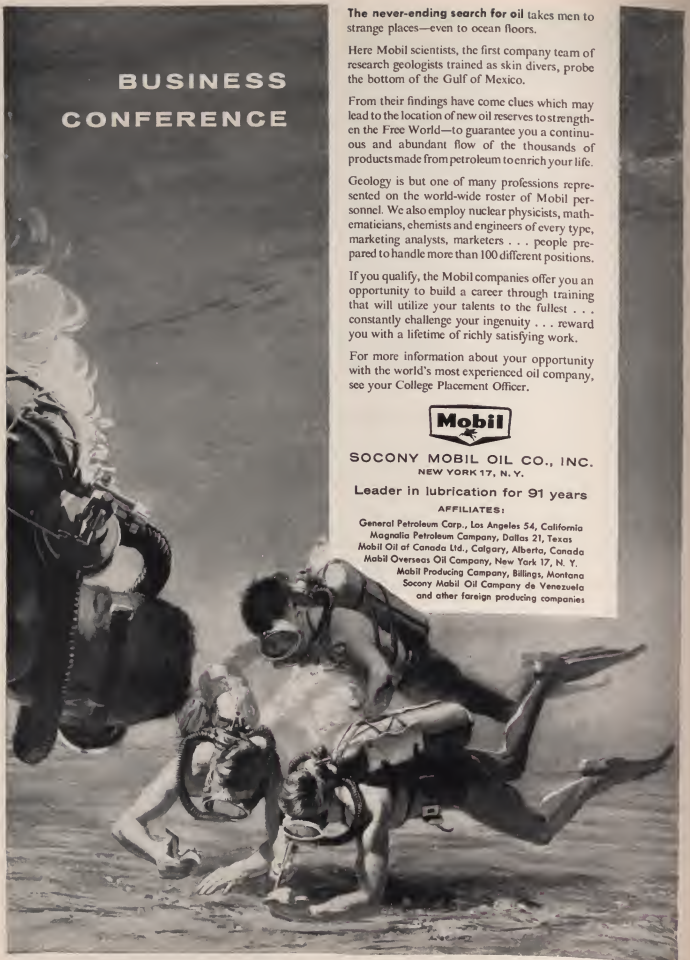

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Mechelectiv

VOL. 17 DECEMBER 1957 NO. 3

SCHOOL OF ENGINEERING, THE GEORGE WASHINGTON UNIVERSITY

In This Issue:

ARTICLES

DEPARTMENTS

Published at the George Washington University by direction of the Engineers' Council. Published six times during the school year in October, November, December, March, April, and May. Entered as second class matter March 6, 1951, at the Post Office at Washington, D. C., under the act of March 3, 1879. Address communications to Mechelectiv Magazine, Davis-Hodgkins House, George Washington University, Washington 6, D. C. or telephone STerling 3-0250, Extension 528.

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Familiar Faces

FRANK "BUD" RYERSON came to G. W. by way of the Navy Band where he played drums and also was used as an arranger and copyist. While stationed with the band here in D. C. he started through engineering on a part-time basis and became a full-time student after completing four years of service. He is still using his musical ability by playing drums with a dance band, The Continentals, on weekends.

Bud was born in Fair Lawn, New Jersey, where he graduated from high school. He studied music at both Columbia and N. Y. U. from 1945 to 1948. He also took a course in machine design at Stewart Technical Institute and worked as a gauge designer for Bailey Engineering Company before enlisting in the Navy. Last summer he worked as an inspector for C. A. A. He was sent to contractor's plants in Connecticut and New York to make sure that everything conformed to specifications.

Bud has served as treasurer of A. S. M. E. and corresponding secretary of Theta Tau. He is also a member of Sigma Tau and the Engineers' Council.

FRANK NARR is one of those rare native Washingtonians, or nearly so, since he lives in nearby Suitland, Maryland. He attended high school in Suitland and was very active in student activities. He was president of the National Honor Society, member of the student council and several clubs, and had a strong interest in speech. He won numerous speaking contests and banked the money he won to pay his way through the first two years of college.

Frank came to G. W. originally on a scholarship to the Junior College but after completing two years he switched to the E. E. curriculum. He has continued his interest in student activities at G. W. by active participation in Pershing Rifles, Theta Tau, Math Club, I. R. E., MECHELECIV, and the Engineers' Council. He has served on several committees of the Council and one of his major accomplishments has been to arrange for the completion of the series of paintings of past deans of the School of Engineering to be presented to the school in the near future. He writes the problem page (which he has titled the "Muzzle Page" for reasons known only to himself).

WOODROW "WOODY" EVERETT, JR., a 6-foot 1-inch electrical engineering student who sports a southern account and a slightly beat up green Rambler convertible, comes to G. W. from Mobile, Alabama, although he was born in Newton, Mississippi.

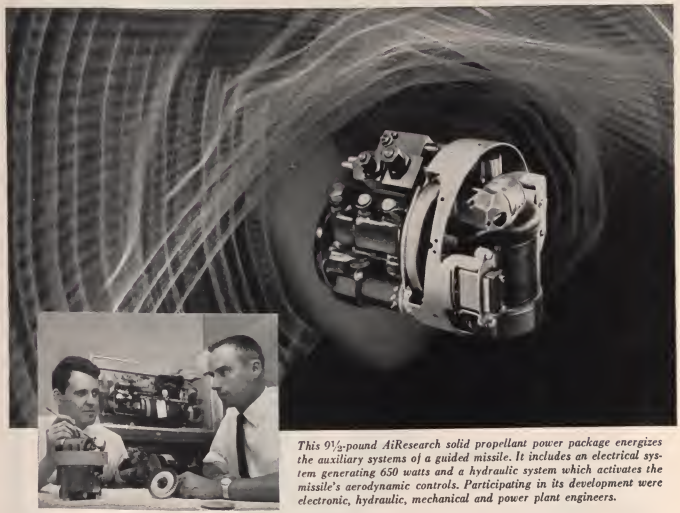
He attended Murphy High School in Alabama and was extremely active in school affairs. He held such positions as president of the Engineers' Club, representative from his class to the Student Council, business manager of the yearbook, and president of the National Honor Society for the state of Alabama. His liking for activities has been evident here at G. W. In 1956 he won the Colonial Cadet Rifle Trophy as the outstanding member on the A. F. R. O. T. C. Rifle Team. At the present time he is secretary of the Engineers' Council, secretary of the AIEE-IRE joint branch, a recently initiated member of Theta Tau (in the initiation skit he played the part of an announcer for a beer commercial who had obviously sold himself on the product), and feature editor of MECHELECIV.

PHIL PAYNE arrived at G. W. School of Engineering by a more circuitous route than most engineers. He went to V. P. I. for two years after graduating from high school in his home town of Richmond, Va., but decided that he would rather be a musician that an engineer. He had some reason to believe that he had natural abilities along this line since he played trumpet, baritone, and piano. Because of his prowess on the latter instrument, he was accepted as a student at Peabody Conservatory. He studied music there for a couple of years until Uncle Sam decided that instead of being an engineer or a musician he should be a soldier.

He took his basic training at Fort Knox and later went to O. C. S. at Fort Sill. After receiving his commission he was assigned to Camp Rucker, Alabama, as a Platoon Leader and Training Officer. Phil left the Army in January, 1954, then tried his hand at selling vacuum cleaners and sewing machines before coming to G. W.

Phil has become fairly active in student activities during his senior year. He serves as vice president of the Engineers' Council, assistant scribe of Theta Tau, and publicity co-chairman of A. S. M. E.

IF you're looking beyond tomorrow...



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ALUMNI EDITORIAL

One, two, three, four! Who are we for! Just an old school yell most of us are familiar with, but it brings up a point. Who *are* we for?

Approximately 1,600 graduates of The George Washington University School of Engineering are registered in the Alumni Office. We know there are more, but we have lost contact with them. How many of this 1,600 are interested in what is going on at G. W.? The number varies from year to year. Last year 350 answered the call for dues and joined or continued their membership in the Engineering Alumni Association. This year we hope that this number can be substantially increased.

Why should I be an alumnus member? This question obviously pops up in many minds when the dues billing notices are received. Membership in The George Washington Engineer Alumni Association serves two purposes. One, it maintains a contact between you and your school so that you can be informed of programs or other events of interest to you. Two, your dues defray the expenses of the Association in planning programs for your benefit as well as that of the students, and in keeping you advised of these programs.

The University has much to offer its graduates but it takes hard work and careful planning to establish and carry out worthwhile events that will be of the utmost value to those concerned. This year, concerted efforts are being made to promote a Frank Howard Lecture.

Plans are also being prepared for a series of seminars and refresher courses intended to bring engineers up to date on current developments and contemplated research. These courses will be prepared exclusively for engineering alumni.

Social events for the purpose of bringing the graduating students in contact with former graduates in an effort to promote closer fraternal ties between them are also on the calendar. It has become traditional for G. W. to provide outstanding engineers. The interest shown in our alumni should acquaint them with this tradition and give them confidence that they can uphold it.

There are many other services that we as alumni can give besides paying our dues. We can interest ourselves in various school functions, contribute funds as well as professional articles to the MECHELECIV, submit recommendations or ideas for the improvement of alumni relations, and volunteer participation in various programs sponsored by the association. You can pass "the word" to other alumni when you know a particular event is to take place and encourage them to attend. If a large number of us each performed some small task from time to time we could accomplish big jobs with little effort. The big jobs are the ones that benefit the most people. In addition to helping yourself, it will also give you that feeling of satisfaction that you have been able to help someone else.

Think it over. Start the ball rolling by returning your envelope with your dollar. (Is that too much to ask?) Then resolve that you will try to do some little service for the School of Engineering at least once during the coming year.

AL MOE,
President, Enginering Alumni Association.

A GEORGE WASHINGTON FIRST

Country's Only Model Structures Laboratory for Undergraduates

By PHILLIP W. MAST, B.C.E. '58

Cited by Professor R. A. Hechtman, Executive Officer of the Civil Engineering Department, as the only school offering engineering undergraduates a Models Laboratory in conjunction with their structures courses, The George Washington University's School of Engineering takes another step toward setting a better foundation for engineers in terms of basic concepts.

How does one teach basic concepts without confusing the student or misleading him? How does one teach the concepts of "pressure line," "string polygon," "static equilibrium," "influence line," and first and second moment-area theorems, just to mention a few.

Though I doubt that any C. E. has ever confused "pressure line" and "water line," the point is made, I believe, that interpersonal ambiguity, ever present in human communication, is an important factor in the teaching of basic concepts. To present the student with the best means of grasping unfamiliar material in the Theory of Structures, Courses I and II, the model laboratory was opened by the C. E. department this fall in Tompkins Hall, Room 204.

The models were fabricated on the many power and hand tools, such as the drill-press, jig-saw, lathe, shaper, and bandsaw, available in the laboratory and in the machine shop, Room M-9. *Figure 1* shows the drill-press being used to mill soft brass. The brass is held in the vise that is clamped to a lay-out table. The lay-out table allows moving the work in two directions under the cutting tool, thus making possible the manufacture of intricate parts by the models lab.

Figure 2 shows the first model made and used by the models laboratory. The model demonstrates the properties of the "string polygon". The plywood board is fastened from behind to the bench, then a cord weighted on both ends by buckets loaded with lead shot is placed over the pulleys at the upper corners. Two weights are then fastened to the

1. Milling soft metal on drill press.

2. Tracing "string polygon" on paper.

3. Parts of three-hinged arch model.

4. "Pressure line" outside arch rib. Structure failed.

5. "Pressure line" inside arch. Structure stands.

cord between the pulleys and allowed to come to rest at a position of static equilibrium. The position of the deflected cord is traced on paper along with the points of application of the loads. The "string polygon" thus produces or will verify the same results as those obtained by graphically constructing the string polygon for the same loads and reactions and comparing the two results.

Figures 3, 4 and 5 show the parts and application of the "three-hinged arch model." *Figure 3* shows the disassembled arch model, its base, a 2.5 pound lead load (pointed out by the pencil), and the two sections of the arch. The arch section on the right is actually in two parts, because of a cut, to render the arch rib incapable of resisting any moment at this point.

Figure 4 shows what happens when the load is placed on the arch at a point which causes the thrust line to fall outside the arch rib at the point indicated by the pencil. The eccentric thrust produced a moment at this point which the arch was unable to resist.

Figure 5 illustrates a correct placement of load to make the thrust or pressure line fall inside the arch rib at the point of the cut. When the arch is stable, as in *figure 5*, the positions of the load and of the arch's hinges are recorded. Then the pressure line is graphically constructed for the arch and its load. Passage of the constructed pressure line inside the arch rib at the point of the cut demonstrates the adequacy of the "pressure line" concept.

Figures 6 and 7 are of the "area-moment theorem verification model." The two area-moment propositions become quite clear and are well-demonstrated by this model. The first proposition states:

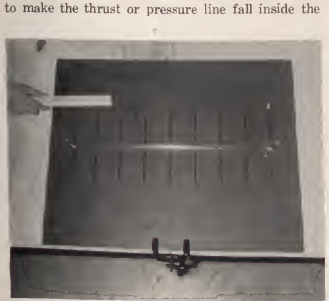
> "The angle between the tangents to the elastic curve of a beam at any two points A and B equals the area of the part of the bending-moment diagram between A and B, divided by EI."

The second proposition is:

> "The vertical displacement of point A from the tangent to the elastic curve at B equals the moment (with respect to A) of the area of the part of the bending moment diagram between A and B, divided by EI."

Referring to *figure 6*, the model is mounted on a

(Please turn to page 20.)



6. Verification of area-moment theorems, beam unloaded.

7. Measuring pointer distances and vertical displacement.

UNIONS FOR ENGINEERS?

Results of Local Survey Indicate "No"

By CARL WALBECK, M.E.A. '60

Will tomorrow's engineers belong to unions similar to the production workers labor unions of today? This question is of utmost importance to engineers and employers alike.

Today, most engineers work in groups, which has created a new class of employee: the practitioner of a profession who is at the same time a salaried employee. This type of employee has an entirely different relationship with his employer than an organization of consulting professionals who are called in on the basis of a flat fee. This group work of engineers has created some of the conditions that make unionization of engineers possible.

There are approximately 600,000 engineers in the profession today. Of these, professional engineering unions claim to represent in collective bargaining more than 45,000. Another 15,000 may be represented by unions of production workers. This is a total of approximately 60,000 engineers now represented by unions.

Labor Unions Today

Labor unionism is the outgrowth of the once progressive and constructive craft guilds of early history. These were groups of craftsmen banded together for mutual improvement of their products and the training of new craftsmen. In recent years, especially since mass production, organizations for collective bargaining purposes have been organized mainly on an industry-wide basis, embracing all the wage earners working in a given industry.

The immediate goals of union activity vary widely with time and circumstances, and give an impression of opportunism which often obscures the underlying objectives. The individual workers, who may have only slender savings, if any, naturally think in terms of "short run" benefits or losses in contrast with the "long run" thinking of economists and businessmen. In most cases, rank-and-file employees are only concerned in getting wages up, hours down, and work lightened by any means at hand. The fact that today's high standard of living is more a result of advancing technology and improved production methods than of union activity is usually ignored by the labor leader.

Engineering Unions

Unionization of engineers began about 1918 with the formation of the American Federation of Technical Engineers. Since that time, many other organizations of professional engineers and technical personnel have been formed. The largest of these is the Engineers and Scientists of America that claims 30,000 members. For the most part, membership in these organizations is limited to scientific, engineering, and technical personnel. They strive to promote the public welfare, and the economic, social, and professional welfare of engineering and scientific employees.

In addition to the strictly professional unions, some engineers are also organized in production workers unions such as the United Steel Workers, the United Automobile Workers, and the International Brotherhood of Electrical Workers. Most of this unionization of engineers was forced by rulings of the National Labor Relations Board because the majority of these engineers were employed in plant operations; not in strictly engineering capacities.

Why Do Engineers Unionize?

While 10 percent unionization of engineers does not constitute a major segment of the profession, it does indicate the existence of possible discontent among a group heretofore considered as unorganizable. Most union officials will admit that employees do not pay dues and take the time and trouble of participating in union affairs unless they are dissatisfied. However, another school of thought holds that, in this age of conformity, many employees join unions for fear of being ostracized by

their fellow workers who are union members.

Several of the professional engineering societies and various other groups have made studies to try and determine just what dissatisfactions exist among engineers that can lead to unionization. These studies indicate that engineer discontent breaks down into three general areas of dissatisfaction: (1) salary; (2) individual; and (3) professional.

The earnings differential between salaried engineers and wage earners has become very narrow in many organizations. Telescoping of salaries, whereby starting engineers salaries approach the salaries of experienced engineers, is a constant irritant to the experienced engineer. In addition, the engineer's former advantage in fringe benefits over the hourly worker has been nearly wiped out by labor union gains. These three factors cause experienced engineers to feel that they are not receiving adequate salary recognition from management.

The disappearance of the old personal relationship between the individual engineer and his employer is regarded as a primary cause of engineer unionization. Treatment of hiring, training, and other employment situations on a mass basis cause the engineer to feel he is not being considered and treated as an individual.

Many engineers feel that they also lost much of their professional status with the mass employment of engineers. In fact, some companies fail to recognize the professional status of engineers, and group them with nonprofessionals. The lack of communication with top management, and the assignment to jobs not requiring a high degree of engineering ability, often retards the engineer in his professional development and denies recognition of his skill.

An Attitude Survey

In an attempt to determine first-hand some of the dissatisfactions existing among members of the engineering profession, and how engineers felt about unionization as the solution to them, the author conducted an attitude survey in the spring of 1957. In addition, this survey satisfied one of the course requirements of Psychology 145 in the Engineering Administration Program of The George Washington University.

The attitude survey was accomplished by means of a questionnaire. Several factors need to be considered in the formation and administration of a questionnaire, chief among which are the size and composition of the group being studied. The largest group of engineers available to the author were members of the Engineering Administration Program. However, other engineers working in industry were included in order to obtain a wider cross-section of the profession. In all, 96 questionnaires were distributed, and returns were received from 75 engineers. Two explanations are offered for this high rate of return: (1) personal contact in the distribution of the questionnaire, and (2) a high degree of interest in the question of unionization among engineers.

Questionnaires were distributed to engineers in the fields of Aeronautical, Chemical, Civil, Electrical, Industrial, Mechanical, Ceramic, and General (Military) engineering. These engineers were employed by military, manufacturing, public utility, aircraft, government, research and development, consulting, and nuclear power organizations. Their positions were listed as Sales, Engineering, Supervisory or Management, Operations, and Technical Writer. Due to the limited number of persons surveyed, it is difficult to apply meaningful results to any particular engineering field, organization, or position classification. The major questions and their results are listed below.

1. "Are you now, or have you ever been, employed by an organization having a collective bargaining unit in which engineers could participate?"
   YES *30%* NO *70%*
2. "If the answer to (1) is 'YES,' were you a member of the collective bargaining unit?"
   YES *29%* NO *71%*

It is interesting to note that while 29% of the eligible engineers were members of the collective bargaining unit, 38% of the eligible engineers who later became supervisors were members of the collective bargaining unit.

3. "If the answer to (2) is 'YES,' was your membership voluntary?"

	YES	NO
Total Group	*50%*	*50%*
Supervisors	*67%*	*33%*

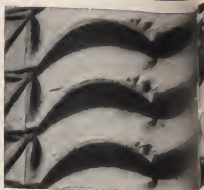
4. "What factors do you think cause engineers to seek unionization?" (Classify in order of importance)
   - *5* a. Mass employment of engineers.
   - *1* b. Salary dissatisfaction.
   - *3* c. Professional dissatisfaction.
   - *2* d. Lack of individual recognition from management.
   - *4* e. Assignment to jobs not requiring engineering ability.
   - *6* f. Desire to go along with the group.
   - *7* g. Other (Specify)

Some of the factors listed as "Other" were:

1. To better understand union policies.
2. Instability of the aircraft industry due to to government contracts.
3. Management recognition of the bargaining unit.
4. Direction of engineering activities by non-engineering management.

(Please turn to page 24.)

What's doing..



Schlieren photographs, above and left, illustrate different phases of airflow investigation. Development of inlets, compressors and turbines requires many such studies in cascade test rigs, subsonic or supersonic wind tunnels.

...at Pratt & Whitney Aircraft in the field of Aerodynamics

Although each successive chapter in the history of aircraft engines has assigned new and greater importance to the problems of aerodynamics, perhaps the most significant developments came with the dawn of the jet age. Today, aerodynamics is one of the primary factors influencing design and performance of an aircraft powerplant. It follows, then, that Pratt & Whitney Aircraft — world's foremost designer and builder of aircraft engines — is as active in the broad field of aerodynamics as any such company *could* be.

Although the work is demanding, by its very nature it offers virtually unlimited opportunity for the aerodynamicist at P & W A. He deals with airflow conditions in the engine inlet, compressor, burner, turbine and afterburner. From both the theoretical and applied viewpoints, he is engrossed in the problems of perfect, viscous and compressible flow. Problems concerning boundary layers, diffusion, transonic flow, shock waves, jet and wake phenomena, airfoil theory, flutter and stall propagation — all must be attacked through profound theoretical and detailed experimental processes. Adding further to the challenge and complexity of these assignments at P & W A is this fact: the engines developed must ultimately perform in varieties of aircraft ranging from supersonic fighters to intercontinental bombers and transports, functioning throughout a wide range of operational conditions for each type.

Moreover, since every aircraft is literally designed around a powerplant, the aerodynamicist must continually project his thinking in such a way as to anticipate the timely application of tomorrow's engines to tomorrow's airframes. At his service are one of industry's foremost computing laboratories and the finest experimental facilities.

Aerodynamics, of course, is only one part of a broadly diversified engineering program at Pratt & Whitney Aircraft. That program — with other far-reaching activities in the fields of instrumentation, combustion, materials problems and mechanical design — spells out a gratifying future for many of today's engineering students.

n electronic computers accelerate both the analy-nd the solution of aerodynamic problems. Some of problems include studies of airplane performance permit evaluation of engine-to-airframe applications.

Design of a multi-stage, axial-flow compressor involves some of the most complex problems in the entire field of aerodynamics. The work of aerodynamicists ultimately determines those aspects of blade and total rotor design that are crucial.

Mounting a compressor in a special high-altitude test chamber in P & W A's Willgoos Turbine Laboratory permits study of a variety of performance problems that may be encountered during later development stages.

Pratt & Whitney Aircraft operates a completely self-contained engineering facility in East Hartford, Connecticut, and is now building a similar facility in Palm Beach County, Florida. For further information about engineering careers at Pratt & Whitney Aircraft, write to Mr. F. W. Powers, Engineering Department.

World's foremost designer and builder of aircraft engines

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Division of United Aircraft Corporation

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Muzzle Page

with Frank Narr

In each of the following issues of MECHELECIV Frank Narr will be with you to present new puzzles which he thinks will be of interest to you, the curious reader.

1. A souvenir firm in Ireland has six employees: Mrs. O'Riley, Mr. O'Connor, Mr. McDonald, Miss Sullivan, Miss McFee, and Mr. St. Patrick. Collectively, they occupy the positions of manager, assistant manager, cashier, teller, clerk, and stenographer. From the following data, determine who holds what position: the assistant manager is the grandson of the manager; the cashier is the stenographer's son-in-law; Mr. McDonald is a bachelor; Mr. O'Connor is 25 years old; Miss Sullivan is the teller's stepsister; Mr. St. Patrick is the manager's neighbor.

2. Two teamsters start their wagons simultaneously from points 10 miles apart and drive directly towards one another. At the same instant, a bee takes off from the front mudguard of one wagon, flies towards the other wagon, lands on its front mudguard, and instantly takes off in the opposite direction, repeating this mad behavior until the wagons pass. Both wagons are moving 5 miles per hour and the bee at 15 miles per hour. How far does the bee fly before the wagons pass each other? Neglect turn-around time and minor geometric errors.

3. Three elderly couples, all lifelong friends, decide to make a one shot try at the stock market to help finance their second honeymoons, using the "lucky system." Each individual (Simon, Mark, Jack, Sylvia, June, Barbara) selects a stock having a price which is a whole number of dollars, and buys a number of shares equal to the sales price. At a Fourth of July celebration, the following facts are disclosed: Each man invested exactly $63 more than his wife; Simon bought 23 more shares than June; Mark bought 11 more shares than Sylvia. What is the name of each man's wife?

4. There are two piers across a river from one another. Boats start out from each pier at the same time. They pass each other at a point 720 yards from one shore. Each boat docks for fifteen minutes and starts back toward the original pier. On the return trip the boats pass each other 400 yards from the shore opposite to the one referred to above. How wide is the river at the point where the boats run?

5. Raymond J. received a phone call last night and didn't recognize the caller's voice. Rather than tell his name, the caller gave the following hints as to his identification: You might have been the grandson of my father's brother's mother; I might have been the grandchild of your brother's father's mother; I might have been the grandchild of your brother's father's mother; but this is not so. However, my paternal uncle knows I am the child of your mother's father's daughter. At this point Raymond J. knew whom he was talking to. Who was it?

6. Suppose that the earth is a perfect sphere 25,000 miles in circumference, and that is possible to string telephone lines on poles around the equator. Assuming that the telephone wire would then form a circle concentric with the equator, would a man be able to crawl under the wire without touching it if the total length of the wire exceeded the circumference of the earth by 100 feet.

7. A man is going to take a trip of 27,000 miles by automobile. His tires are guaranteed for the limit of 12,000 miles each. What is the least number of tires that he must take to make the trip, including the four tires on his car.

8. A gangster named Vince Rider was murdered in Wheaton at 3:30 A.M. on the morning of March 17. A week later five men were arrested in Philadelphia and questioned. Each made four statements. Mr. District Attorney had to seek further clues, but we have inside knowledge that one of the five was guilty and that each suspect made three true statements and one false statement. Review the statements and find the guilty party.

Phil: I was in Chicago when Rider was murdered. I never killed anyone. Dan is the guilty one. Frank and I are pals.

Rastus: I did not ki'l Rider. I never owned a revolver in my life. Dan knows me. I was in Hyattsville on the night of March 17.

Pat: Rastus lied when he said he never owned a revolver. The murder was committed on St. Patrick's Day. Phil was in Chicago at the time. One of us five is guilty.

Frank: I did not kill Rider. Dan had never been in Wheaton. I never saw Phil before now. Rastus was with me in Hyattsville on the night of March 17.

Dan: I did not kill Rider. I have never been in Wheaton. I never saw Rastus before. Phil lied when he said I was guilty.

9. The hour hand and the minute hand of a watch coincide every 65 minutes. Is the watch inaccurate, and if so, how many hours will it take for the watch to gain or lose one hour?

10. A pipe of three inches inside diameter contains a 1-inch outer diameter and a 2-inch outer diameter rod. What is the largest diameter rod that can still be fitted in the pipe?

ANSWERS TO NOVEMBER PROBLEMS

1. 
2. 8-2/11
3. 1, 3, 9, and 27 pounds
4. 97 minutes
5. C. E.—Baker
   E. E.—Davis
   M. E.—Allen
   Physicist—Curtis
6. 192 mph
7. Five
8. 20 miles
9. 9567
   1085

   10652
10. 16 weeks

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RADIO CORPORATION OF AMERICA

ELECTRONICS FOR LIVING

EMBLEM CONTEST

The Engineers' Council is sponsoring a contest for a design that will be suitable for adoption as the official emblem of the School of Engineering. The person submitting the winning design will receive a ticket for free admission for one couple to the Engineers' Banquet and Ball to be held this spring, a certificate of recognition, and two cartons of Marlboroughs through the courtesy of Ernie Auerbach, campus representative.

The contest is in progress and will continue until March 31, 1958. Designs should be submitted in final draft and, if not actually colored, should have the various colored areas designated. Entries should be placed in the box provided on the table just inside the door of the Davis-Hodgkins House at 731 22nd Street N. W. The designs will be judged by a committee appointed by the Engineers' Council.

There are no limitations as to the type of emblem or colors to be used. It is suggested, however, that the colors be limited to two in addition to black and that the colors be suitable for use as the official colors of the School of Engineering. The emblem may be of the "Coat of Arms" type or any other type suitable for reproduction in many different forms. The emblem will be used on athletic shirts as well as on printed material and therefore should not be too elaborate. The design should be such that the emblem will be instantaneously recognizable as the symbol of the engineering school. The emblem may include lettering or not as the designer sees fit.

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Motors

Control

V-Belt Drives

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- System Analysis (Electrical and Mechanical)
- Stress Analysis
- Hydraulics
- Electronics
- Process Engineering
- Mechanical Design
- Structural Design
- Metallurgy
- Nucleonics
- High Voltage Phenomenon
- Analog and Digital Computers
- Fluid Dynamics
- Basic Research

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5196

STRUCTURES LAB

(Continued from page 11.)

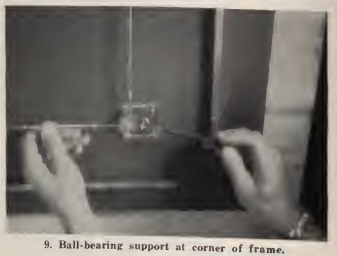
24 by 30-inch plywood base and painted flat black. The beam is a $\frac{1}{8}$ inch by $\frac{1}{4}$ inch piece of brass stock, pinned at the left end to a plastic block fastened to the base. The beam's right end is pinned to a piece of 6 inch brass strip which is pinned at its other end to the base. The effect is a simply supported beam. As can be seen from *figure 6*, nine $\frac{1}{8}$ inch brass rods sharpened on both ends are fastened to the beam. By measuring changes in the distances between pointter tips, the angle changes effected by loading the beam can be computed.

More clearly visible in *figure 7* is a 24 inch piece of $\frac{1}{8}$ inch brass rod which runs parallel to the beam and is fastened to the beam at its right end. Loading the beam causes a deflection between the rod and beam at its left end (*figure 7*). Since the rod is still tangent to the beam at the right end we have the "vertical displacement" referred to in the second area-moment theorem.

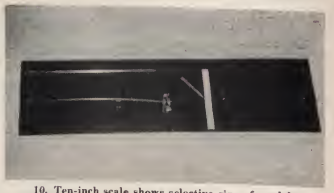
8. Deflected shape of frame loaded by deformater at right reaction.

With the beam unloaded, the distances between the pointer tips are recorded. The load is applied by means of a hook, string, and pulley arrangement. Then the pointer distances are again recorded and the vertical displacement between left end and the $\frac{1}{8}$ inch rod is measured and recorded. By computing and totaling the angle changes, comparing the total angle change to the computed area of the bending moment diagram, and comparing the vertical displacement to the moment of the bending-moment diagram about the left end of the beam, the theorems are verified.

Figure 8 is of a portal frame model. The bars at the top and sides are $\frac{3}{8}$ inch square brass rod and are used as a place from which to measure deflections of the frame. The frame is of brass rod. Deformaters at the left and right reactions introduce horizontal and vertical shear and moment into the frame by an arrangement of holes and pins that permit displacing either reaction horizontally or vertically and rotation of the joint. *Figure 9* is a detail of the ball-bearing support that is under the frame at its two corners.



9. Ball-bearing support at corner of frame.



10. Ten-inch scale shows selective size of model.

Figure 10 is a model of a three span continuous beam. The ten inch scale shown is used to measure beam deflections by sliding along the brass rod at the top of the model. White marks on the beam have a small black dot at their center and are used as points where deflections are to be measured. The middle span has an internal deformater included in the beam.

Presented were five of the seven models constructed this first semester. A number remain to be built for next semester's Theory of Structures, Course II.

Alumviews

Mecheleciv Visits Vitro Corporation

LOUIS L. CLIPP (*BME '57, AFROTC, Rifle Team, ASME*) joined the professional staff of Vitro's Silver Spring Laboratory in June 1957 as an Engineer. Lou was assigned to work on a special research project in undersea warfare. Recently he won second prize in the Vitro Golf Tournament. Lou lives at 2204 Hall Place, N. W., Washington, D. C.

ROBERT C. ESTES (*BEE '57, Sigma Alpha Epsilon, IRE*) joined the professional staff of Vitro's Silver Spring Laboratory in July 1957 as an Engineer. Since joining the staff, Bob has been working on a research project involving noise reduction. He resides at 1811 41st Place, S. E., Washington, D. C.

WARREN R. CROCKETT (*BEE '57, IRE, Engineers' Council*) joined the staff of Vitro's Silver Spring Laboratory in September 1957. He is presently working on a project involving the design of guided missile systems for ships of the U. S. Navy. Warren and his family live at 1230 Faraday Place, N. E., Washington, D. C.

RONALD R. HOLLANDER (*BSE '57, Theta Tau, AFROTC, Honorary Society, Arnold Air Society*) joined Vitro's Silver Spring Laboratory in June 1957 as an Engineer. He was assigned to the Missile Systems Department to work with a team of scientists and engineers on the missile system for the U. S. Navy's first nuclear-propelled cruiser. On September 6, 1957, Ron left on a Military Leave of Absence for a tour of duty as an officer with the U. S. Air Force.

ROBERT W. FULCHER (*BEE '57, Theta Tau, Sigma Tau*) joined the professional staff of Vitro's Silver Spring Laboratory in June 1957 as an Engineer. His assignment was to an undersea warfare project. On September 13, 1957, Bob left on a Military Leave of Absence, reporting to Hamilton Air Force Base, San Rafael, Calif.

JAMES C. MOSELEY (*BEE '49, IRE*) joined the professional staff of Vitro's Silver Spring Laboratory as an Engineer in March 1956. He is currently involved in research work on the U. S. Navy's POLARIS missile program. Jim is now married and has three daughters. His address is 1607 Amherst Road, Hyattsville, Maryland.

GEORGE W. PYNN (*BEE '51, Sigma Tau*) joined Vitro's Silver Spring Laboratory in August 1956. At the present time, he is working on the guided missile system for one of the U. S. Navy's new warships. George and his family make their home at 11 Underwood Place, N. W., Washington, D. C.

JAMES E. PEAKE (*BME '57, Varsity Golf, Arnold Air Society, ASME*) joined the professional staff of Vitro's Silver Spring Laboratory as an Engineer in June 1957. He worked on projects concerned with the design of guided missile launchers for the U. S. Navy until September 1957. At this time Jim left for a tour of duty as a Second Lieutenant with the U. S. Air Force at the 3640th Pilot Training Wing, Laredo Air Force Base, Texas.

Other Alumviews

JOHN F. BURNS (*B.S. in E.E. '33*) is working as an Examiner in the U. S. Patent Office and is presently concerned with electronic memory devices. John's oldest son, Allan, is a senior at Cornell University, majoring in Soil Chemistry. The next oldest son, John, is a senior at Washington-Lee High School but expects to start work toward an E.E. degree next fall. John's present address is 3015 North Edison Street, Arlington, Va.

GERALD L. WARNER (*B.E.E. '50*) is a senior electronic engineer at Raytheon Mfg. Co. Missile Systems Division in Bedford, Mass. He says that his wife, Shirley, and family, Lee (3 years) and Sandra (1 year) are quite happy with their new contemporary split level home in Sudbury, Mass. Their address is RFD 3, Brentwood Road.

GERALD M. MICHAEL (*B.C.E. '49*) took a Master of Science in Sanitary Engineering at Johns Hopkins University in 1950 and a Master of Public Health Engineering at the University of California in 1957. He now has two boys, 1 and 4 years old, and is working as a Water and Sewage Training Consultant. His current address is USPHS—CDC, 50 7th Street, N. E., Atlanta, Georgia.

EDMUND C. HUGHES, Lt. CEC, USN (*B.C.E., '52*) has just returned to D. C. after "three wonderful years at Pearl Harbor where I acquired another half stripe and two wonderful children, Wendy Leigh, age 2½, and Edmund Keith, age 10 months." He is now a prospective Public Works Officer at the Naval Receiving Station, Anacostia. His present address is 5709 21st Avenue, Hillcrest Heights, Maryland. Ed winds up his note with a pitch for the Navy.

UNIONS

(Continued from page 13.)

5. "In what ways do you think unionization can aid engineers?" (Classify in order of importance)
   - *2* a. Salary increases.
   - *4* b. Improved professional status.
   - *5* c. Individual recognition.
   - *3* d. Job classification.
   - *1* e. None.
   - *0* f. Other (Specify).
6. "Do you think the interests of the individual engineer are compatible with those of unions?"
   YES *19%* NO *81%*
7. "Do you personally feel the need for unionization?"
   YES *6%* NO *94%*

Conclusions

Among the engineers surveyed, several interesting facts and attitudes were brought out. Some of these are:

1. Unionized engineers do not constitute a very large segment of the group surveyed.
2. Unionization of engineers appears to exist mainly in those organizations employing large numbers of engineers; namely, research and development, and public utility organizations.
3. Previous union membership does not hinder an engineer in advancing into supervisory and management ranks. On the contrary, it may be beneficial in that it helps the engineer to understand the desires and attitudes of the other employees.
4. Dissatisfaction among engineers is confined mostly to salary dissatisfaction, lack of individual recognition, and assignment to jobs not requiring engineering ability.
5. Most engineers feel either that unionization cannot aid them, or that it can aid them only in the field of salary increases.
6. The majority of engineers surveyed did not feel the need for unionization as it exists today. However, many would like to see the engineering societies take a stronger hand in advancing the salary and recognition problems. Some would like to see the formation of an organization similar to the American Medical Association for the advancement of the individual and the profession.

While unionization among engineers is not very serious at the present time, management should take steps to decrease the dissatisfactions of engineers in their present jobs. If this is not done, these dissatisfactions may grow, as mass employment of engineers continues, and may cause unionization of engineers to become a serious problem.

NEWPORT NEWS BUILT two 39'-7" horizontal gas scrubbers, such as this, for J. F. Pritchard & Co. They were made of ASTM-A212 Grade B fire box steel, with structural mesh steel interiors.

Gas scrubber made of 2⅞" steel

Newport News builds almost any type of pressure vessel and other heavy process equipment

Here is one of two horizontal gas scrubbers recently built for an operating pressure of 1800 psi at 300°F.

Newport News made both vessels from fire box steel, 2⅞ inches in thickness. We formed and automatically welded this steel into sections having a diameter of only 4 feet.

Rolling thick steel to this small diameter...no easy accomplishment, as you probably know . . . demonstrates the sort of jobs Newport News takes in stride.

Almost any type of heavy processing equipment is readily constructed by Newport News in a 225 acre plant comprising huge, fully equipped fabricating and machine shops, foundries, forge and die shops, heat treating and allied equipment as well as complete test facilities.

Newport News shop erection of fabricated units helps to speed assembly at your plant site.

Get a bid from Newport News on your present or future projects. Get the benefit of specialized production techniques. Look over the many ways in which Newport News can help you . . . write for "Facilities and Products", a very interesting booklet. It's yours for the asking.

ENGINEERS . . . Desirable positions available in this commercial shipyard. Representatives at Placement Office annually. Arrange a personal interview or write Personnel Manager.

ROLLING 2⅞" STEEL for gas scrubbers. The steel, in a hot condition, was formed on the heavy bending equipment shown here. It will cold roll mild steel up to 3 inches thick, and will hot roll any grade of steel up to a thickness of 5 inches.

Newport News Shipbuilding and Dry Dock Company
Newport News, Virginia

SLIPSTICK SLAPSTICK

Hardalino: I suppose you wish I were dead so you could spit on my grave.

W. W.: Not me—I hate to stand in line.

About the only thing you can look down on and approve of at the same time is a plunging neckline.

Salesman: Sir, I have something here that will make you popular, make your life happier, and bring you a host of friends.

Dick B.: I'll take a fifth.

A group of prohibitionists looking for the advantages of total abstinence were told of an old man 102 years old who had never touched a drop in his life. So they rushed to his home to get a statement. After propping him up in bed and guiding his feeble hand along the dotted line, they heard a violent disturbance coming from another room—furniture being broken, dishes smashed, and the shuffling of feet. "Good heavens, what's that?" they gasped. "Oh," whispered the old man as he sank exhaustedly into his pillows, "that's Pa—he's drunk again."

The day before finals, a disheveled C.E. walked into his psychiatrist's office, tore open a pack of cigarettes, and stuffed tobacco up his nose.

"I see that you need some help," remarked the startled doctor.

"Yeah," agreed the student, "Gotta match?"

A despondent old gentleman emerged from his club and climbed into his limousine.

"Where to, sir?" asked the chauffeur.

"Drive off a cliff, James, I'm going to commit suicide."

Little Girl: "Mother, are there skyscrapers in heaven?"

Mother: "No, dear, it takes engineers to build skyscrapers."

Frank N.: "Do you know what good clean fun is?"

Jack O.: "No, what good is it?"

Overheard in the D-H House: "All a sweater does for her is make her itch."

"Just because my eyes are red is no sign I'm drunk. For all you know, I may be a white rabbit."

"I wish I had my wife back."

"Where is she?"

"I swapped her for a bottle of scotch."

"And now you realize how much you love her?"

"No, I'm thirsty again."

The liner had just sunk and one of the lifeboats was filled beyond capacity. The captain gravely announced the fact and jumped overboard. Another passenger got up, said, "Vive la France," and jumped. A third said, "God save the Queen," and repeated the deed. At that a burly Texan got slowly to his feet, exclaimed, "Remember the Alamo," and threw a Mexican overboard.

Drunk (to bartender): "Hey, gimme a horse's neck."

Second Drunk: "I'll have a horse's tail. There's no use killing two horses."

"Hey Dad, I'm home from school again."

"What the devil did you do this time?"

"I graduated."

A meek little man walked into a barroom and ordered two drinks from the burly bartender. He drank one of the drinks and poured the other into his shirt pocket. After about ten rounds of this procedure the bartender says, "Pal, why are you pouring the other drink into your shirt pocket?" The little man jumped up into the bartender's face and snarled, "Mind your own business, you big bum, or I shall come over the counter and whale the fire out of you." About that time a blurry-eyed mouse stuck his head out of the pocket and said, "That goes for your damned cat, too."

Cadet Col. Reining: "Does your uniform fit satisfactorily?"

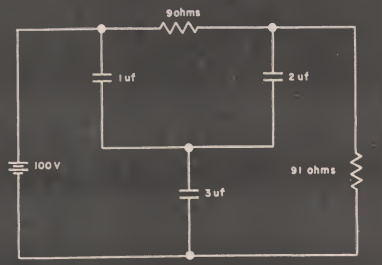
Cadet Basic: "Well, the jacket is okay, sir, but the pants are a little snug under the armpits."

Lawyer, reading last will and testament to expectant relatives: "And so, being of sound mind, I spent every damn cent I had before I died."

A tree is an object that will stand in one place for years, then jump in front of a lady driver.

CAN YOU FIGURE IT OUT?

In the circuit shown, determine the voltage appearing across the 3 microfarad capacitor. Assume that the circuit has been operating long enough to achieve an equilibrium state.



*Solution at bottom of page

Gerald Maley tells what it's like to be...and why he likes being...a Product Development Engineer with IBM.

***SOLUTION**

The voltage across the 3 uf capacitor is 47 volts. This answer may be verified as follows:

Since the voltage across the 91 ohm resistor is 91 volts in the steady state, then

$E_1 + E_3 = 100$ or $E_1 = 100 - E_3$ (1)

and $E_2 = E_3 - 91$ or $E_2 = 91 + E_3$ (2)

let $Q_1 = i_1T = CE_1$

let $Q_2 = i_2T = CE_2$

then $Q_3 = i_1T + i_2T$ or $CE_3 = C(E_1) + C(E_2)$ (3)

By substituting in equation (3) the expressions for E_1 and E_2 given in equations (1) and (2), we have:

$CE_3 = C_1 (100 - E_3) + C (91 + E_3)$

Substituting all known values in this equation gives:

$(3 \times 10^{-6}) E_3 = (1 \times 10^{-6}) (100 - E_3) + (2 \times 10^{-6}) (91 + E_3)$

Dividing by 10^{-6}

$3E_3 = 100 - E_3 + 2 (91 + E_3)$

$6E_3 = 282$

$E_3 = 47$ volts **Answer**

FIGURING OUT A CAREER?

Selecting a career can be puzzling, too. Here's how Gerald Maley found the solution to *his* career problem—at IBM:

"What sold me on IBM," says Jerry, "was their approach to engineering. I'd expected rooms full of engineers at desks. Instead, I found all the friendly informality of my college lab." Starting as a Technical Engineer in Product Development, Jerry learned a great deal about electronic computers in a very short time. He was promoted to Associate Engineer after 16 months. Recently, he was made Project Engineer, supervising the development of magnetic cores. "In computer work," he says, "you can actually see electronics at work. This is not the case with all such equipment today. In this new field, you can be an important contributor in a very short time."

* * * *

There are many excellent opportunities for well-qualified engineers, physicists and mathematicians in IBM Research, Development and Manufacturing Engineering. Why not ask your College Placement Director when IBM will next interview on your campus? Or, for information about how your degree will fit you for an IBM career,

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In minutes the survey plane flies over the prospective site, making overlapping stereo photographs.

A sharp eye in the sky picks plant sites, appraises soil and water supply

Stereo aerial photographs in the hands of Donald J. Belcher & Associates Incorporated, Ithaca, N.Y., reveal a wealth of information about a location in a fraction of the usual time and at far less cost.

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One of a series*

Interview with General Electric's
W. Scott Hill
Manager—Engineering Recruiting

Qualities I Look For When Recruiting Engineers

Q. Mr. Hill, what can I do to get the most out of my job interviews?

A. You know, we have the same question. I would recommend that you have some information on what the company does and why you believe you have a contribution to make. Looking over company information in your placement office is helpful. Have in mind some of the things you would like to ask and try to anticipate questions that may refer to your specific interests.

Q. What information do you try to get during your interviews?

A. This is where we must fill in between the lines of the personnel forms. I try to find out why particular study programs have been followed, in order to learn basic motivations. I also try to find particular abilities in fields of science, or mathematics, or alternatively in the more practical courses, since these might not be apparent from personnel records. Throughout the interview we try to judge clarity of thinking since this also gives us some indication of ability and ultimate progress. One good way to judge a person, I find, is to ask myself: Would he be easy to work with and would I like to have him as my close associate?

Q. What part do first impressions play in your evaluation of people?

A. I think we all form a first impression when we meet anyone. Therefore, if a generally neat appearance is presented, I think it helps. It would indicate that you considered this important to yourself and had some pride in the way the interviewer might size you up.

Q. With only academic training as a background, how long will it be before I'll be handling responsible work?

A. Not long at all. If a man joins a training program, or is placed directly on an operating job, he gets assignments which let him work up to more responsible jobs. We are hiring people with definite consideration for their potential in either technical work or the management field, but their initial jobs will be important and responsible.

Q. How will the fact that I've had to work hard in my engineering studies, with no time for a lot of outside activities, affect my employment possibilities?

A. You're concerned, I'd guess, with all the talk of the quest for "well-rounded men." We do look for this characteristic, but being president of the student council isn't the only indication of this trait. Through talking with your professors, for example, we can determine who takes the active role in group projects and gets along well with other students in the class. This can be equally important in our judgment.

Q. How important are high scholastic grades in your decision to hire a man?

A. At G.E. we must have men who are technically competent. Your grades give us a pretty good indication of this and are also a measure of the way you have applied yourself. When we find someone whose grades are lower than might be expected from his other characteristics, we look into it to find out if there are circumstances which may have contributed.

Q. What consideration do you give work experience gained prior to graduation?

A. Often a man with summer work experience in his chosen academic field has a much better idea of what he wants to do. This helps us decide where he would be most likely to succeed or where he should start his career. Many students have had to work hard during college or summers, to support themselves. These men obviously have a motivating desire to become engineers that we find highly desirable.

Q. Do you feel that a man must know exactly what he wants to do when he is being interviewed?

A. No, I don't. It is helpful if he has thought enough about his interests to be able to discuss some general directions he is considering. For example, he might know whether he wants product engineering work, or the marketing of technical products, or the engineering associated with manufacturing. On G.E. training programs, rotating assignments are designed to help men find out more about their true interests before they make their final choice.

Q. How do military commitments affect your recruiting?

A. Many young men today have military commitments when they graduate. We feel it is to their advantage and ours to accept employment after graduation and then fulfill their obligations. *We have a limited number of copies of a Department of Defense booklet describing, in detail, the many ways in which the latter can be done. Just write to Engineering Personnel, Bldg. 36, 5th Floor, General Electric Company, Schenectady 5, N. Y.* 959-8

*LOOK FOR other interviews discussing: • Advancement in Large Companies • Salary • Personal Development.

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